U. S. DEPARTMENT OF AGRICULTURE.

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THE PROPAGATION AND PRUNING OF PLANTS.

SUGGESTIONS FOR TEACHERS IN SECONDARY SCHOOLS.[1]

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I. PLANT PROPAGATION.

RELATION OF SUBJECT TO COURSE OF STUDY.

A consideration of the propagation of plants is a suitable introduction to the study of horticulture. A knowledge of practical plant propagation will be needed in fruit growing, vegetable gardening, floriculture, and landscape gardening. It is asssumed that before horticulture is taken up as a phase of plant husbandry the students will have lessons on how plants grow, either as part of their agriculture or as a phase of botany. In the study of plant propagation there is abundant opportunity for an application of the knowledge of plant growth which a practical course in botany should develop. It is advisable to have students in horticulture take botany as a prerequisite to the subject or have it the same year horticulture is given. If the latter plan prevails there should be close cooperation and correlation between the teaching of the two subjects.

The aim in teaching this subject in secondary schools should be to establish the general principles on which plant propagation is based and to make practical application of these principles to those forms of propagation which may be applied on the farm and about the house. In sections where practically all nursery stock for orchard planting is purchased, methods of budding and grafting employed in nursery practice need be given little emphasis. Possibly in such sections the farmers have the problem of top working undesirable varieties, hence a need for paying more attention to methods adapted to such a purpose. The able teacher will adapt his instruction to the needs of his students and the community in which they live.

The extent of the course will vary with the needs of the community and the time and equipment available. In communities where horticulture is important schools giving four years of agriculture and having a greenhouse and nursery plats may give a special course in plant propagation with profit. Such course may involve from one-fifth to one-half of a unit credit. Schools giving but a general course in agriculture or plant husbandry may be able to devote but two or three lessons to the subject.

CLASSROOM INSTRUCTION.

Use of reference material.—The subject as it may be given in the usual high-school course in horticulture may be based upon Farmers' Bulletin 157, The Propagation of Plants. The bulletin should be supplemented with special ref-

[1] Prepared under the direction of C. H. Lane, chief specialist in agricultural education, States Relations Service.

erence books for methods important in the community which are not included in the bulletin. While each student should secure a copy of the bulletin, special assignments may be made to individual students to report on methods described in the books of reference.

Classification of methods.—The following classification of the methods of propagation should be helpful to the students in grasping the subject:

I. Sexual propagation.
    1. Seeds.
    2. Spores.
II. Asexual propagation.
    1. Parts intact—
        (*a*) Suckers.
        (*b*) Stolons.
        (*c*) Layers, tip, mound, and vine.
        (*d*) Approach grafting—inarching.
        (*e*) Division of crown.
    2. Parts detached—
        (*a*) Specialized buds; bulbs, bulblets, corns, tubers.
        (*b*) Cuttings:
            1. Herbaceous: stem, leaf, tuber, root.
            2. Hardwood: stem, root.
        (*c*) Grafting: whip, cleft, tongue, bark, splice, veneer, saddle, and shield.
        (*d*) Budding: shield (T-budding), prong, plate (including H-budding), flute, ring, and chip.

Consideration of methods.—Little time should be given to a consideration of methods which are not to be applied to practice. If time permits, the purpose of all the forms of propagation may be discussed briefly, with examples given of each. The time of the classroom may be spent to best advantage in a discussion of the principles which underlie the practice. He should understand as far as possible why certain precautions should be taken in practice and why special methods are used for certain plants. Such discussion involves the elements of plant physiology.

Use of illustrative material.—Most lessons in plant propagation may be given to better advantage in garden, nursery, and greenhouse than in the classroom. If the school is located near commercial greenhouses or nurseries, advantage should be taken of such places in organized field trips. The instructor should make arrangements with the owners and plan the class visits when that work is going on which will be of most interest and value to the class. Fresh material to illustrate various forms of natural propagation and herbaceous cuttings should be brought into the classrooms and used. Permanent mounts to illustrate various hardwood cuttings, grafting, and budding may be made a part of the school museum for classroom use.

PRACTICUMS AND PROJECTS.

A school greenhouse and nursery.—Plant propagation is essentially an art to be learned by practice. Although many farm operations may be assigned as practicums to be learned upon the home farm, most of the work of plant propagation involves such a degree of skill and watchful care that it needs constant and careful supervision not usually to be given on the home farm. In the Northern States, where any extensive work in plant propagation covering a wide range of methods and materials is to be a part of the school curriculum

a greenhouse is necessary. A small greenhouse will be found a valuable asset in connection with much of the work in plant husbandry. It will serve to lengthen the season for practical work and supply living material for plant study throughout the year. The greatest problem in sections where temperatures drop very low is keeping up sufficient heat at night. A heating system apart from the school building is advisable. At a Vermont high school the students built the greenhouse and installed a heating system. One of the students sleeps at the greenhouse during the winter months. An electric alarm system installed by the students warns him when the temperature drops below normal. The production of flowers and plants for sale will aid in meeting the expense of such a house. Although the greenhouse should be considered a laboratory and used primarily for instructional purposes, incidentally it may be drawn upon to supply plants for decorative purposes as well as for classroom use in botany and horticulture.

As an adjunct to the greenhouse, hotbeds, cold frames, seed beds, and nursery plats will be needed for work in plant propagation. Such beds and plats will take the place of a greenhouse where the latter is not feasible. In California and the Southwest the lath house is also an important part of the equipment in horticulture. Lath houses and lath frames for beds should be used more extensively in other sections.

In plant propagation the time for practice should be at least equal to the time for class work. It will be preferable to give most of the time to practical work. The time given and the nature of the practice will depend upon the school, the course given, and the community. For most work students should have some sort of aprons, overalls, or jumpers, so that fear of getting their clothes soiled will not interfere with good work. Each student should be responsible as an individual for the success of his work from beginning to end. As far as practicable those forms of propagation should be selected in which results may be determined; the exercise should not be considered complete until it is determined whether the plant grows or not. In bedding work the propagation beds may be marked off and equal parts assigned to individual students. Neatness and accurate care should be insisted on from the start. Skill, as shown by deftness and rapidity, may be gained by practice after habits of careful accuracy are developed.

Some schools not provided with a greenhouse or nursery are making their work practical by using commercial concerns about the school. Arrangements are made by the teacher for the student to do a certain amount of work involving skill under the direction of the owner or trained foremen of greenhouses and nurseries near the school. Until the student learns the process it is considered a part of his school work and he is given credit for it as a part of his course in horticulture. After he becomes skilled he is often able to continue some of the work each day, receiving pay for his service.

Making hotbeds and coldframes.—Although the building of a greenhouse may be beyond most classes, there are few schools at which it will not be possible to make some kind of hotbeds and coldframes. The making and use of these devices for controlling heat will furnish good practice in mechanic arts as well as horticulture. Directions for the making and care of hotbeds and coldframes may be obtained from Farmers' Bulletin 195, Annual Flowering Plants. The making of lath houses and frames where needed will make suitable practicums.

Minor practicums.—Schools not able to furnish well-organized practice at the school should do what they can to connect such practice as may be secured for

students upon the home farm with the instructions at the school. In connection with home work the following practicums may be carried on in most schools:

(1) Making grafting wax according to directions in Farmers' Bulletin 157, Propagation of Plants.

(2) Testing seed: Practicums in seed testing are very common in connection with farm crops and methods are well understood. In connection with the consideration of seeding as a means of propagation the germination of a variety of vegetable, flower, and tree seeds may be undertaken with profit. Directions for testing seed may be obtained in Farmers' Bulletin 428, Testing Farm Seed in the Home and Rural School.

(3) Making seed flats: The making and planting of seed flats and window boxes not only furnishes simple handicraft work but also supplies equipment for practice and study in developing plants from seeds.

Home projects.—In certain localities, especially those near cities, there is a market for plants produced by seeding in greenhouses and hotbeds or produced by some form of asexual propagation. The production of plants for sale represents a rather highly specialized phase of farming and involving usually a high degree of skill, makes an excellent project for advanced students. The extent to which the student enters into the work will determine whether it be made his major project or not. A student may grow some plants for sale as a minor project in connection with a major project in floriculture, vegetable gardening. or the growing of small fruits. The growing of nursery stock for orchard trees and ornamentals will not make a suitable project as a rule, because it involves too long a time and the student can not compete well with commercial nurseries. Some simple specialty, such as roses, privet for hedges, currants, and grapes, may be undertaken safely and with profit.

II. PRUNING.

RELATION OF SUBJECT TO COURSE OF STUDY.

Pruning, like plant propagation, is a phase of practical horticulture based on a knowledge of how plants grow. Any general course in horticulture should give the students a knowledge of the underlying principles of pruning with practice as varied and as extensive as time will permit. Although in a brief elementary course the subject must necessarily be considered in a very general way, as the work in horticulture extends more definite instruction in pruning should be given. Rather than extend general lessons in pruning or to give a special course in the subject, it will be better to consider pruning in connection with different phases of horticulture, as the practice of pruning is so intimately connected with general culture. In a course in fruit growing pruning of fruit trees should be considered; a course in home ground ornamentation would be incomplete without some attention to the pruning of ornamentals, hedges, and shade trees, and in connection with floriculture such phases of pruning as disbudding should be considered. If the course in fruit growing precedes the other courses, the underlying principles and methods of general practice may be taught in such a way in connection with the pruning of fruit trees that only a brief review of such principles will be necessary in connection with their application in the other courses.

CLASSROOM DISCUSSION.

Relation of principles to practice.—There is probably no subject in the agricultural curriculum which exemplifies so well the relation of principles to practice, of science to art, as does pruning. Although pruning is essentially an art

to be learned by practice, yet intelligent practice depends upon a knowledge of the specific plants to be pruned and the manner in which they adjust themselves to new conditions, especially to the new condition introduced by pruning. It has been observed that foreign laborers, who have learned to prune certain kinds of plants by the apprenticeship method in their home country, find difficulty in adapting their methods to new plants and new conditions in this country; while students who have studied the elements of plant physiology and histology in relation to pruning, as a rule have little difficulty in learning to prune groups of plants according to their needs.

Sequence of lessons.—Practice in pruning should have a definite relation to the classroom instruction. Inasmuch as most of the practice in pruning will come in the late winter and early spring, a general discussion of pruning may come best at this time in connection with a course in fruit growing. Special application to other phases of horticulture may come at any time in connection with special courses or the part of the general course which deals with the other phases. For example, the lesson on pruning ornamentals may come in connection with the improvements of the home grounds. The lesson outlines which follow have a logical order. A lesson on buds and the bearing habits of trees is a good place to begin, not only because this knowledge is essential to an understanding of the principles of pruning but also because the students may begin with concrete illustrative material which is very interesting. Practical work should be given in connection with the lessons on principles so that the students will have concrete experience to build upon.

LESSON 1.—*A Study of Buds.*

1. What the bud represents.
2. Fruit buds vs. leaf buds.
3. When do buds form.
4. Arrangement of buds.
5. Adventitious buds.
    (*a*) Suckers and water sprouts.
6. Bearing habits of representative trees.
    (*a*) Apples and pears.
    (*b*) Peaches and almonds.
    (*c*) Plums, apricots, and cherries.
    (*d*) Walnuts and pecans.

LESSON 2.—*Why Prune Trees?*

1. Is pruning a devitalizing process?
    (*a*) Analogy between pruning and such farm operations as thinning.
    (*b*) Nature's methods of pruning.
2. Directing the growth of a plant.
3. Removing dead branches.
4. Checking diseases.
5. Regulating bearing habits.
6. A means of thinning fruits and flowers.
7. Pruning in connection with top working and planting.

LESSON 3.—*Principles of Pruning.*

1. Disturbing the balance in growth.
    (*a*) Effect of heavy pruning of the top.
    (*b*) Effect of root pruning.
    (*c*) Influence of season.
    (*d*) Plants tend to resume normal habit.

LESSON 3.—*Principles of Pruning*—Continued.

2. Influence of age with respect to pruning.
    (*a*) Effect of pruning young trees.
    (*b*) Effect of pruning bearing trees.
3. Effect of pruning on setting of fruit.
    (*a*) Pruning for growth.
    (*b*) Pruning for fruit or flowers.
    (*c*) Checking growth.
    (*d*) Obstruction of sap.
4. Influence of climate.
5. Healing of wounds.

LESSON 4.—*General Practices of Pruning.*

1. Pruning tools.
    (*a*) Knives.
    (*b*) Saws.
    (*c*) Shears.
    (*d*) Miscellaneous devices.
    (*e*) Tools not to be used—axes.
2. Ladders.
3. Using the knife and shears.
4. Removing large limbs—use of the saw.
5. Treatment of wounds.
6. Removal of brush.

LESSON 5.—*Pruning Young Fruit Trees.*

1. Pruning at time of planting.
    (*a*) Cutting back the head.
    (*b*) Trimming the roots.
2. Forming the head.
3. Specific directions for successive years until bearing age is reached of the following:
    (*a*) Apple, (*b*) pear, (*c*) peach, (*d*) plum, (*e*) cherry, (*f*) walnuts, pecans, almonds, apricots, and any other fruit trees of local importance.
4. Pruning young trees which have been neglected.

LESSON 6.—*Pruning Trees in Bearing.*

1. Pruning the apple.
2. Pruning the pear.
    (*a*) Standard.
    (*b*) Dwarf.
    (c) Control of blight.
3. Pruning the peach.
4. Pruning the plum and cherry.
5. Pruning miscellaneous trees of local importance.
6. Pruning in relation to freezing and frost injury.

LESSON 7.—*Renovating Old Orchards.*

1. Possibilities in renovation.
2. Forming new heads.
3. After treatment of renovated trees.
4. Pruning top-worked trees.
5. Scraping and cleaning in relation to sanitation.

LESSON 8.—*Pruning Small Fruits.*

1. Bearing habits of grapes, raspberries, blackberries, dewberries, currants, gooseberries, etc.
2. Pruning the grape.
   (*a*) Systems of pruning American grapes.
   (*b*) Systems of pruning Vinifera grapes.
3. Pruning raspberries.
4. Pruning blackberries and dewberries.
5. Pruning gooseberries and currants.

LESSON 9.—*Pruning Ornamentals and Shade Trees.*

1. Purposes in contrast with purpose of pruning fruit trees.
2. Pruning for symmetry.
3. Pruning roses and other flowering shrubs.
4. Pruning evergreens.
5. Pruning deciduous shade trees.
6. Pruning hedges.

LESSON 10.—*Practical Tree Surgery.*

1. Relation to ordinary pruning.
2. Antiseptic treatment of wounds.
3. Preparation of cavities.
4. Use of cement and asphalt.
5. Guying of limbs.
6. Possibilities in commercial work.

Use of reference material.—Although general references on horticulture and fruit growing deal with pruning as a rule, wherever the subject is considered extensively the students should have access to a good pruning manual. As a basis for the lessons suggested the following publications of this department will serve well: Farmers' Bulletin 181, Pruning, for general principles and practices with application to apples, pears, peaches, plums, cherries, grapes, raspberries, blackberries, currants, gooseberries, hedges, street trees, and flowering shrubs. For directions for renovating an old orchard, see Farmers' Bulletin 491, The Profitable Management of the Small Apple Orchard on the General Farm. In the Yearbook for 1913 will be found material for lesson 10, in an article entitled "Practical Tree Surgery." More specific directions for pruning smal fruits will be found in the following Farmers' Bulletins: 213, Raspberries; 471, Grape Propagation, Pruning, and Training; 643, Blackberry Culture; 709, Muscadine Grapes; and 728, Dewberry Culture.

In connection with the lesson dealing with the pruning of ornamentals, Farmers' Bulletin 750, Roses for the Home, will be found helpful. Although there may not be time for all the class to consider all of the special references, special assignments may be made to individual members either for study in connection with their projects or for special reports to the class.

Use of illustrative material.—The lessons should start out with an abundance of illustrative material on hand. Branches of different classes of trees and fruit trees of different bearing habits should be brought into the classroom as a concrete basis for a study of buds. If this lesson is given in the winter or early spring, later, when the buds open up, a field trip may be profitable in extending and checking up on this study. Students should be encouraged to make individual observations in connection with all of their study of natural phenomena and verify statements found in books. Sometimes general statements may not apply in the locality. For example, students in a western high school found

that the statement generally made in eastern texts that apples bear fruit only on wood 2 years old or older did not hold true, as they found abundant cases where fruit set on 1-year wood. There are few subjects which will develop interest and powers of observation better than a study of the bearing and flowering habits of plants.

Inasmuch as suitable material is not always available out of doors, and it is not always convenient to take the class to the orchard, good use may be made of photographs and charts showing the steps in training trees, contrasting good and bad pruning, and showing habits of growth of different varieties. Some teachers have gone a step further and have had ideal trees mounted to show the forming of the head in different stages of development.

Adaptation to local conditions.—If pruning is considered in the upper years of the secondary school, or if students come to the high school after having thorough work in nature-study and elementary agriculture, it may be possible to enter at once into a study of the underlying principles and practices of pruning. In most cases, however, time may be spent very profitably in a preliminary study of buds. This is but an example of the general principle that the instruction should be applied to the needs and capacities of the particular set of students one may have. In a like manner, the course should be adapted to the community. There is little use of considering the pruning of Vinifera grapes in most sections of the East, while in some sections of California a number of lessons may be spent profitably on this one phase of pruning. In a peach-growing section the principles of pruning should be learned chiefly in the application to the pruning of peaches, while in another section one of the big problems will be the control of pear blight by means of pruning. Publications of State departments and colleges should be used in adapting the lessons to meet local conditions. The instructor should make a study of local practices with a view of extending the good and checking the bad.

PRACTICAL WORK.

Home and school practicums.—As suggested, there should be ample opportunity for practical work in connection with the lessons. Such work may be done either by the class as a whole upon the school farm, or neighboring farms in the community, or as individual practicums by the students at home. If the class is not too large for efficient supervision, there is economy in having the class as a whole, or sections of it, for group work. The work should be announced a day before so that students may come prepared with suitable clothing for field work. If the school does not own a sufficient number of tools for each student, the students should bring them from home. Although it will be necessary for the teacher to give abundant demonstration of the use of the tools, it should be remembered that the students will get out of the work largely in direct proportion to what they put into it in practice. A good teacher will keep the students busy. It may happen that some of the students may be more or less efficient in the use of pruning tools and hence have little interest in the elementary work. It will be better for all concerned if such students are used to aid in directing the work of others.

If there is opportunity for any phase of pruning at home while the subject is being considered in school, an effort should be made by the teacher to connect this work with the classroom instruction and direct it in such a way that it will have educational value. Where such may be done, this work should be accepted in lieu of school work, or in some other way given credit. The class should take advantage of any opportunity to do necessary pruning which will

involve needed practice, whether the work is at school, at home, in the village, or on neighboring farms. After the students have made a good start in any phase of pruning the instructor should help to secure odd jobs of pruning for them which they may do outside of school hours for remuneration.

The following practicums are suggested as fitting best with the lessons outlined:

1. *Pruning in connection with planting.*—Such work is really incidental to planting and should come in connection with practice in planting.

2. *Pruning young fruit trees.*—As much practice as may be secured should be given in starting 1 and 2 year old trees of different kinds, according to the needs and ideals of the district. Although it may not be possible for the class or any individual member to follow up this pruning year by year until the tree is in bearing, practice should be given with young trees of different ages which have been pruned properly before. Practice should also be given with trees which have been neglected or improperly pruned.

3. *Pruning bearing trees.*—Practice in pruning bearing trees should be limited only by the time and material available. There should be opportunity for practice on trees with such diverse habits and needs as the apple and the peach in sections where both are grown.

4. *Pruning neglected trees.*—Although in many sections of the West the problems of pruning center about young orchards and bearing trees which have had regular pruning, in many sections of the East the chief concern in pruning is to put neglected orchards into shape for profitable production. In such sections most of the practice should be with old trees. Pruning of such trees may be correlated profitably with practice in top working.

5. *Pruning small fruits.*—Practice in pruning small fruits may come very well in connection with lessons on the culture of small fruits as it is related so closely with systems of culture and training. As suggested, the practice in pruning small fruits will depend upon the type of fruits grown as well as the systems of training adapted best to the section in which the school is located.

6. *Pruning ornamentals and hedges.*—Practical work in pruning ornamentals and hedges should be given in connection with the improvement of the home grounds. If the school grounds are planted as all rural school grounds should be, there will be opportunity for practice at the school.

7. *Pruning shade trees.*—The pruning of shade trees may also come in connection with the home and school grounds. There will be need for caution and careful supervision in giving the students practice with shade trees after they have had training with fruit trees. In some cases the agricultural students of rural high schools have taken care of the trees of the village parks and streets and have thus secured considerable practice in pruning and at the same time developed a spirit of community service.

8. *Practical tree surgery.*—Closely related to the general pruning of shade trees is the repair of large trees which have become broken and hollow. It may not be possible for secondary students to do any extensive work along this line, yet they may apply some simple preventive measures, such as guying. Further practice along this line should depend much upon the teacher's ability to direct the work.

Projects.—Extensive work in pruning may be involved in either class projects or individual home projects of a more general nature. If the class undertakes to renovate a neighboring orchard or to care for the town park such a project would doubtlessly involve considerable pruning as well as spraying and general care. Likewise a student in connection with a home project in any form of fruit production or home-ground ornamentation will have opportunity for a

good deal of practical pruning. Inasmuch as the renovation of an old orchard is very largely a question of judicious pruning, the following outline is suggestive of a home project which will involve an application of much that is learned in the class work and school practice in pruning.

RENOVATION OF AN OLD ORCHARD.

A DEMONSTRATION PROJECT.

I. Shall I undertake to renovate an orchard as my project?
   1. Am I willing to undertake a project with little hope of immediate financial reward?
   2. Will it not be worth while to gain practical experience in orchard management?
   3. Will it not be worth while to demonstrate to the community the value of modern methods?
   4. May I not make arrangements whereby I may share in the future profits which may result from my work?

II. Is the orchard worth renovating?
   1. Are the trees too old?
   2. Does vigorous growth indicate a good root system?
   3. Is there a good stand of trees?
   4. Are the trees of a variety known to be profitable?
   5. Can I control all pests which may prevail?

III. How shall I prune the orchard?
   1. Do I understand the principles underlying the pruning of fruit trees?
   2. What tools will be required for my pruning work?
   3. Can I use the pruning shears with dexterity?
   4. Can I remove large limbs properly by using the saw?
   5. What time of the year shall I do my pruning?
   6. Will it be necessary to start new heads on the trees by "dehorning"?
   7. Will it be necessary to remove a great many water sprouts, suckers, diseased and dead branches?
   8. What treatment shall I give wounds left in removing large branches?
   9. How shall I treat the rough trunks that they may not harbor pests?
   10. What part shall pruning play later in keeping my trees in shape and as an aid toward producing fine fruit?

IV. How can I change the trees to a more desirable variety?
   1. Do I understand the principles underlying budding and grafting?
   2. Are my trees in such shape that top-working will be profitable?
   3. What method of top-working shall I use?
   4. Can I make a successful cleft graft and whip graft?
   5. Can I do ordinary budding with dexterity?
   6. At what time of the year shall I graft or bud my trees?
   7. What variety shall I use?

V. What fertilizing shall I give the orchard?
   1. Do I understand the function of the fertilizing elements and their relation to tree growth?
   2. If severe pruning has stimulated a vigorous growth, will the trees need nitrogen?

V. What fertilizing shall I give the orchard?—Continued.
   3. Will the application of fertilizers containing phosphoric acid and potash be beneficial?
   4. What is the cheapest and best form in which I can apply the elements needed?
   5. What are the objections to using barnyard and green manures the first year after the trees have been cut back severely?
   6. When and how shall I apply fertilizers?

VI. How shall I cultivate the orchard?
   1. What are the purposes of cultivation?
   2. What are the advantages of cultivation over leaving the orchard in sod?
   2. May it be advisable at any time to leave an orchard in sod?
   4. What implements will be required for the cultivation of the orchard?
   5. Am I able to do the plowing, harrowing, and cultivating which may be necessary?
   6. When should cultivation cease?

VII. Shall I use a cover crop?
   1. What is the distinction between a cover crop and the practice of intercropping?
   2. What important purposes do cover crops serve?
   3. What crops are suitable for the purpose?
   4. What crop shall I use and how shall I manage it to secure maximum returns?

VIII. How can I control orchard pests?
   1. What equipment will I need for spraying?
   2. Can I make Bordeaux mixture and lime sulphur sprays and apply them in such a way as to control fungous diseases?
   3. Can I use lead arsenate and Paris green effectively in the control of biting insects?
   4. Can I control insects with sucking mouth parts, such as aphids and San Jose scale?
   5. Do I know the life histories and habits of the insects I must control?
   6. What may I do to supplement spraying in the control of orchard pests?
   7. What may I do to get my neighbors to cooperate with me in the control of orchard pests?
   8. Will it pay me to buy a spraying outfit, or will it be more profitable to hire the spraying done?

IX. Shall I thin my fruit?
   1. What are the advantages claimed for the practice?
   2. What objections are there against it?
   3. Do I understand the details of thinning that I may practice it efficiently?

X. How shall I harvest my crop?
   1. What equipment will I need for picking?
   2. When is the fruit ready to pick?
   3. Do I understand the details of picking that I may practice it efficiently?
   4. If I need help in picking, can I manage the pickers to secure the best results?

XI. How shall I market my crop?

1. Shall I store my fruit or sell it directly from the orchard?
2. What preparations must I make for grading and packing?
3. What kind of package shall I use?
4. What system of grading and packing shall I follow?
5. Do I understand the details of grading and packing that I may do it myself or supervise it efficiently?
6. What plans must I make for marketing that I may get maximum returns?
7. What am I going to do with the fruit that does not grade up to standard?

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